

DESIGN AND DATA IN BALANCE

Using Design-Driven Decision Making
to Enable Student Success

Foreword by Carmen Fariña, *Chancellor*
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FOREWORD

AS SCHOOLS CHANCELLOR FOR NEW YORK CITY,

I have many opportunities to see at first hand the extraordinary work of schools all across the city. What I find over and over again is this: in the most effective schools, teachers, principals, and other school staff work closely with one another, and with parents and families, to give students the academic and emotional supports they need to learn, grow, and thrive. These successful schools are strong in part because they are organized to enable that sort of collaboration.

This report offers a detailed description of how educators at one such school, the High School of Telecommunication Arts and Technology (Telly), created and employ structures that help them keep students on the path toward graduation and college readiness, particularly in the crucial early years of high school. Working in teams, Telly teachers keep a close eye on their students, observing their progress from many angles and maintaining a constant awareness of where they need assistance and support. Telly educators also review data about student performance, ask probing questions about the patterns they see, and act swiftly and consistently to help students succeed. In short, the professionals at Telly have the curiosity and the commitment to use design and data in complementary ways to help keep students on track.

Schools are extraordinarily complex organizations, and it is not always easy to see how the pieces fit together. This report—part analysis, part case study—offers readers an in-depth look at a school that has achieved strong outcomes for its students. By describing not just what the innovative educators at Telly do but how they do it, *New Visions for Public Schools* gives us lessons from which educators everywhere can learn.

— Carmen Fariña, *Chancellor*,
New York City Department of Education

INTRODUCTION

Data-driven approaches to school decision making have come into widespread use in the past decade, nationally and in New York City.¹ New Visions has been at the forefront of those developments: in New Visions schools, teacher teams and school teams regularly examine student performance data to understand patterns and drive classroom- and school-level improvements.² Since 2007, our in-house data team has produced an extensive array of data and analytic frameworks, intended to give educators a clear picture of what's happening in their schools and the detailed information they need to improve their practice.³ We believe strongly that schools, like all high-performing organizations, need to use data strategically, learn from it, and base decisions on evidence informed by data.⁴

New Visions also recognizes the importance of school design. Since 2001, we have guided dozens of teams of educators through the process of designing small high schools, helping them to create coherent, complex school organizations—each one unique while also adhering to a set of common design principles, such as personalized learning environments, school-based professional development, and integration of technology into teaching and learning.⁵ Yet the work of design does not end when a new school is up and running. Across our network, we see existing schools use data productively by viewing information through the lens of design. A design perspective helps them look at data diagnostically, asking what in a school's underlying structures could account for patterns of success and failure. Design also enables them to use data prospectively, asking how school structures can be changed or refined to achieve better results. In short, high-performing school teams use data-driven and design-driven approaches in tandem to organize their schools to meet the needs of students. Both are prerequisite to meaningful problem solving and planning.⁶

To gain a better understanding of the dynamic between data and design, the New Visions data team took a closer look at schools that have used thoughtful approaches to achieve impressive results. This study describes how teachers and school leaders at the High School of Telecommunication Arts and Technology (familiarily known as Telly) used data and design to strengthen programming for students in grades 9 and 10, thereby improving outcomes for all students.

We explore Telly's inner workings primarily from the perspective of design-driven improvement. In other words, we begin by clarifying the school's vision and its essential mental models—particularly its belief that investing in students' success in grades 9 and 10 pays off powerfully for the entire school. We then look at how that mental model is expressed in programmatic and organizational structures that help meet students' needs and enable meaningful transactions among educators. We also look at student performance data and describe how, through design-driven analysis of those data, the school has thoughtfully engineered structures that help students make steady progress toward meeting the demands of high school graduation and postsecondary readiness.

Telly's story holds lessons for other schools, including those in the New Visions network. We also believe that it sheds light on an important debate in education today: should we design schools and education policy in response to data or on the basis of our aspirations for students and our knowledge of effective teaching and learning? Telly's example shows that the data-vs.-design dichotomy can be reconciled at the level of the school. It is possible, and indeed necessary, to embrace both.

TELLY

AT A GLANCE

THE HIGH SCHOOL OF TELECOMMUNICATION ARTS AND TECHNOLOGY (Telly) is one of New York City's higher-performing public high schools. Over the past three years, Telly has consistently achieved four-year graduation rates of 80 percent or better, with nearly all graduates receiving Regents or Advanced Regents diplomas. Telly is an "educational option" school, one of a category of New York City high schools that intentionally enroll a representative mix of students, including significant percentages from groups that often struggle to succeed in high school.¹² The school's sustained strong outcomes suggest that it has developed effective mechanisms for helping a wide range of students advance toward graduation and college readiness.

SCHOOL DATA

STUDENT POPULATION, 2012–13

	TELLY	NEW YORK CITY
Enrollment, grades 9–12.....	1,292	329,386
Eligible for free or reduced-price lunch	80.6%	79.4%
Black.....	8.5%	28.8%
Hispanic.....	54.3%	40.1%
Students with disabilities or an IEP	22.5%	17.5%
English-language learners	5.5%	13.6%

Source: NYC DOE School Demographics and Accountability Snapshot

STUDENT PERFORMANCE, 2012–13

Four-year graduation rate	82.5%	66%
Regents and Advanced Regents diploma	79.1%	62.6%
Advanced Regents.....	38.0%	17.2%
Regents	41.1%	45.4%
Graduates qualified for CUNY college-level work.....	57.6%	31.4%

Sources: NYC DOE High School Progress Report Results (2014) and Preliminary (2013) and Citywide (2014) Graduation Rates. School data on Advanced Regents and Regents diplomas awarded provided by the school.

DESIGN-DRIVEN DECISION MAKING AT TELLY

The mission of every high school is to provide students with

the learning opportunities and supports they need to move on successfully to postsecondary learning and meaningful careers.

A diploma, typically conferred at the end of four years, is the credential that signifies that a student has completed the high school course of study and is ready for the next stage of education and work.

A school's ability to fulfill its mission is to a large extent a by-product of how it organizes itself.⁷ Key school attributes, such as leadership, professional capacity, and instruction,⁸ and core systems, such as attendance, assessment, budget and purchasing, and safety and discipline,⁹ have profound effects on student performance and outcomes. A school's job is to align those components so that all its students, high-performing and lower-performing alike, can get to graduation and earn a degree.

In 2012, New Visions created a tool that charts performance data for cohorts of students across four years of high school and enables educators to visualize the “flow” of students between higher and lower levels of performance on the path to graduation. (See *pages 14–23*.) Our research has uncovered patterns of volatility in some schools, both positive and negative—moments when something in the organization of a school results in large numbers of students getting on track to graduation or falling further behind.¹⁰ Brooklyn's High School of Telecommunication Arts and Technology, or Telly, is among the successful schools our analysis has identified.

Telly is particularly successful at keeping high-performing students on track from the time they enter high school through graduation and at helping mid-performing students reach higher levels of performance. The school also has effective strategies for helping almost-on-track students build their skills and earn the credits and scores they need to graduate on time and, in many cases, be ready for college. We therefore decided to examine certain aspects of its organization—in this case, specific programmatic structures for students and organizational structures for teachers—to understand how they operate to foster student success.

THE NEW VISIONS PSO NETWORK

New Visions for Public Schools was founded in 1989 with the mission of improving the quality of public education in New York City. In 2007, the New York City Department of Education invited New Visions to become a partnership support organization (PSO) to provide instructional, leadership, and operational support to a network of schools. Principals were given the authority to choose the organization with which their school would affiliate. Phil Weinberg, who was then principal of Brooklyn's High School of Telecommunication Arts and Technology (Telly), chose New Visions. For New Visions, working with larger schools such as Telly represented a new challenge, since our previous experience had been designing and launching small high schools in partnership with the Department of Education.

Today, as a PSO, New Visions is accountable for the academic success of seventy-five schools, mainly at the secondary level, which together enroll approximately forty-six thousand students. An important dimension of New Visions' work is to identify and document noteworthy school practices, such as the design-driven approach educators at Telly are using to raise levels of student achievement.

Our staff writes regularly about exemplary practices emerging from schools in the New Visions network at www.newvisions.org/blog.

The Iceberg Model and School Improvement

To gain a clear understanding of Telly's inner workings, we applied an analytic framework known as the iceberg model (**Figure 1**).

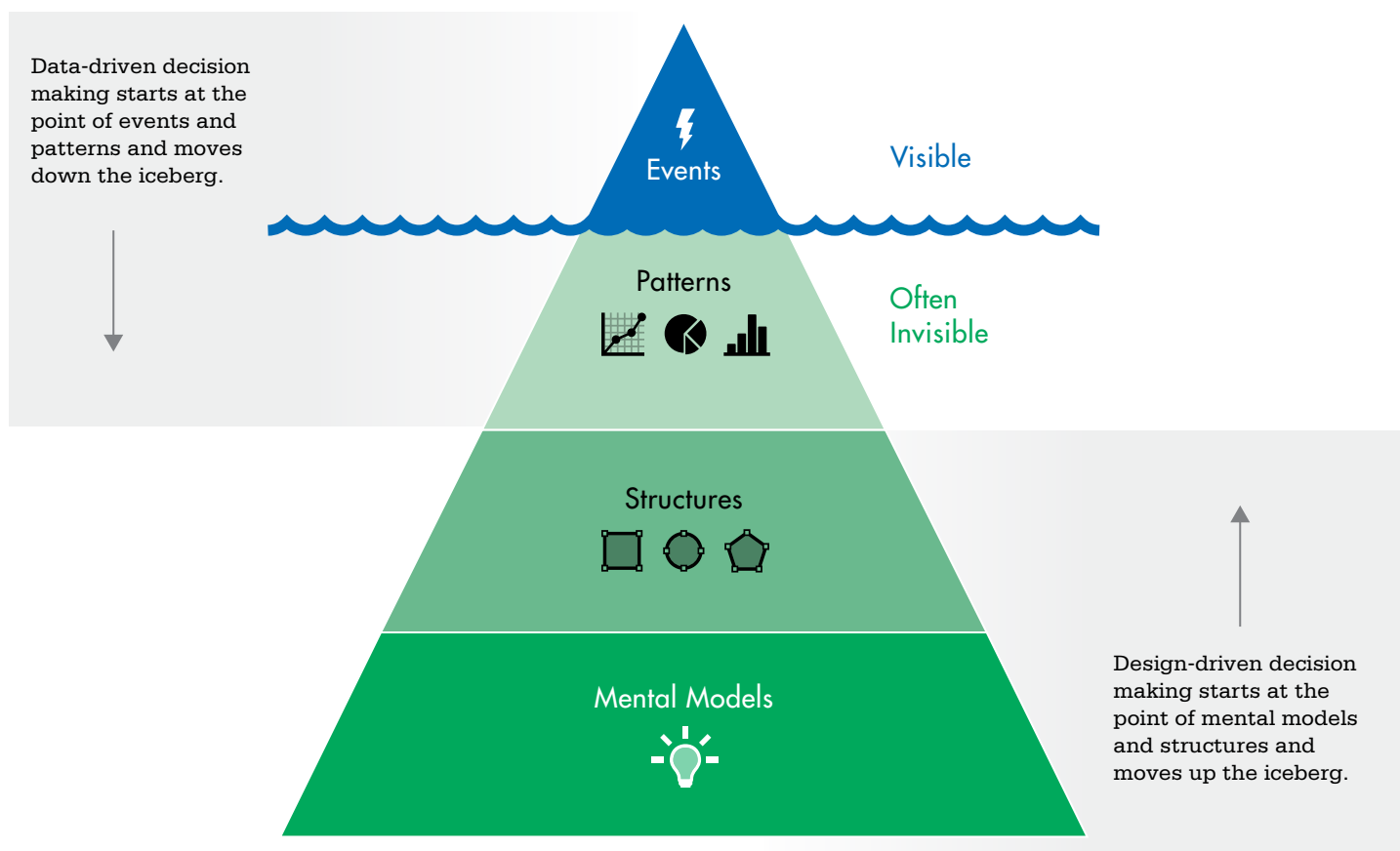
The iceberg model is often used in systems thinking to represent system behavior.¹¹ Events, the most visible part of a system, appear at the tip, while less visible but higher-leverage parts of the system, including patterns, structures, and mental models, reside beneath the water.

Data-driven analysis typically begins with visible events and the often discernible patterns that a system produces. In schools, those events and patterns include, for example, how well students do in required courses or end-of-year exams, rates of teacher turnover, and overall school performance at a moment in time or over time, all of which can be represented by quantitative data. With those data in hand, researchers—or, for the purposes of planning, a

principal or school team—might try to discern the system's underlying structures. A data-driven approach is retrospective: it starts with empirical evidence of what is (that is, what the system has already generated) and tries to draw conclusions based on those observations.

In contrast, a design-driven approach inverts the iceberg and begins with an organization's mental models and structures. Building on an understanding of a school's foundational mental models, a researcher, school leader, or planning team might examine the extent to which school structures—how departments are organized, how students are programmed for certain courses—are aligned with that vision, and consider school and student data against that backdrop. In this way, a design-driven approach is prospective, offering insights into likely patterns of system behavior.

Figure 1. The Iceberg Model as an Analytic Tool for Data- and Design-Driven Decision Making



GETTING TO GRADUATION IN NEW YORK CITY & NEW YORK STATE

To earn a Regents diploma, a New York high school student must earn a total of forty-four course credits in English (eight semesters), social studies (eight), math (six), science (six), foreign language (two), physical education/health (five), art or music (two), and electives (seven). In addition, a student must pass a total of five New York State Regents exams (covering English, global history, U.S. history, math, and science) with scores of 65 or higher.

To earn an Advanced Regents diploma, a student who enters high school in 2014 is required to pass an additional four Regents exams in math and science; earn additional course credits in math, science, and foreign language; and complete an approved sequence in arts or career and technical education.¹³

Local diplomas are available to special education students under certain circumstances.

The City University of New York (the primary receiver of the city's public high school graduates) allows students to bypass remediation courses if they have earned Regents exam scores of at least 80 in math and 75 in English, and 65 or better on three additional exams. Students must also have completed a three-course math sequence in high school, including Integrated Algebra, Geometry, and Algebra 2/Trigonometry.

“Maybe we should say to students, ‘We’re not going to blame you for the fact that you aren’t in shape when you enter high school. We’re going to enroll you in a social system that will get you this credential. We’re going to concentrate on making these four years as valuable for you as possible.’”

—*Former principal,*
Philip Weinberg

STUDY METHODOLOGY

Research for this report was carried out by New Visions staff as part of their regular work to support schools in the New Visions PSO network. Members of the New Visions data team met with Telly’s leadership team in August 2013 to discuss how the school’s programming influenced students’ progress toward graduation, as reflected in its “stock-and-flow” map (page 14). That conversation led to deeper inquiry into specific structures that drive high performance. New Visions staff visited weekly from November 2013 through March 2014 to meet with the school’s programming staff, grade advisors, and grade and department teams to gain an understanding of how educators use design-driven decision making to shape and improve programs for students. The authors also conducted extensive interviews with school leaders and teachers to get a clear picture of how Telly’s differentiated structures for students in grades 9–10 and grades 11–12 actually operate.

All student and school performance data cited in this report come from publicly available New York City Department of Education (NYC DOE) Progress Reports and longitudinal cohort 2013 data (Custom STARS Report 1.14, Custom STARS Report 1.15, and RESI and RGCS reports from ATS). We also use NYC DOE Progress Report data and methodology when comparing Telly’s performance with that of a group of similar or “peer” high schools, as determined by NYC DOE. (See Appendix A for more information about how NYC DOE identifies peer schools and Telly’s performance on various measures.)

This report also presents student performance data as depicted in New Visions’ own stock-and-flow maps, analytic tools that assist educators in visualizing NYC DOE data, assessing student progress, and taking action to improve student outcomes. See Appendix B for more information on New Visions’ student performance metrics, which enable us to gauge students’ progress toward graduation and college readiness for each semester of high school and, in turn, to calculate stock-and-flow. A detailed discussion of stock-and-flow is presented on pages 14–23 of this report.

Designing Structures for Student Success in Grades 9 and 10

To maximize the likelihood that all students will earn a meaningful diploma within four years, a school’s programming must be designed to direct the flow and speed of students’ academic trajectories from the moment they enter 9th grade. A school therefore needs strategies for managing three key factors: the different levels of skills and knowledge students bring when they enter high school, the different rates at which they accumulate credits, and the narrowing opportunities for earning credits and passing required exams for students who fall behind. These variables affect scheduling and programming for the entire school.

Consider the example of Student A. She enters high school performing at grade level, hopeful that she will complete eight semesters of coursework, accumulate credits, pass all required exams, and graduate four years later. If, however, she fails to meet certain requirements and falls off track at the end of 9th grade, she will need to make up those shortfalls over the next three years while still maintaining her forward momentum if she wishes to graduate on time.

This is a challenging situation for the student, but it also places extra demands on her school. When Student A falls behind, her school will need to invest additional resources to move her back on track. The further behind she falls, the more resources will be needed. At the same time, the window to intervene narrows as she approaches senior year. The challenges are even greater, for both student and school, for a 9th grader who arrives in high school performing below grade level.

At Telly, many of the school’s core structures are designed to reflect an essential mental model: intensive resources applied during freshman and sophomore years will produce long-term gains for all students in the school. The school’s teachers and administrators believe that students who are on track early in their high school careers are more likely to develop the foundational skills they need to progress to more advanced coursework and stay on track later on.

Therefore, to manage student trajectories in grades 9 and 10, Telly has designed three core programmatic structures:

THE LANDSCAPE

A coherent, rigorous core curriculum that readies students for postsecondary experiences

THE PATHWAYS

A scheduling and programming strategy that creates multiple opportunities for students to navigate the curriculum

THE STEPS

Steady development of foundational skills and academic behaviors that educators support through a set of intentionally designed social structures

Telly also shapes student trajectories through organizational structures that enable teamwork, common planning, and professional learning experiences for teachers, thereby supporting teachers as learners. That is, educators are organized in ways that make full use of their expertise. In turn, their expertise is widely made available to other teachers throughout the school via collaborative teacher teams.



“Ninth grade is all about adjustment, so kids need lots of personal attention. Because we are providing a heightened level of attention for that first year, we are able to address concerns before they become problems. The longer you let a problem grow, the harder it is to correct. We want our kids to be enrolled in electives junior and senior years, not remediation.”

—*Assistant principal*, Christina Mednick

Core Curriculum: The Landscape

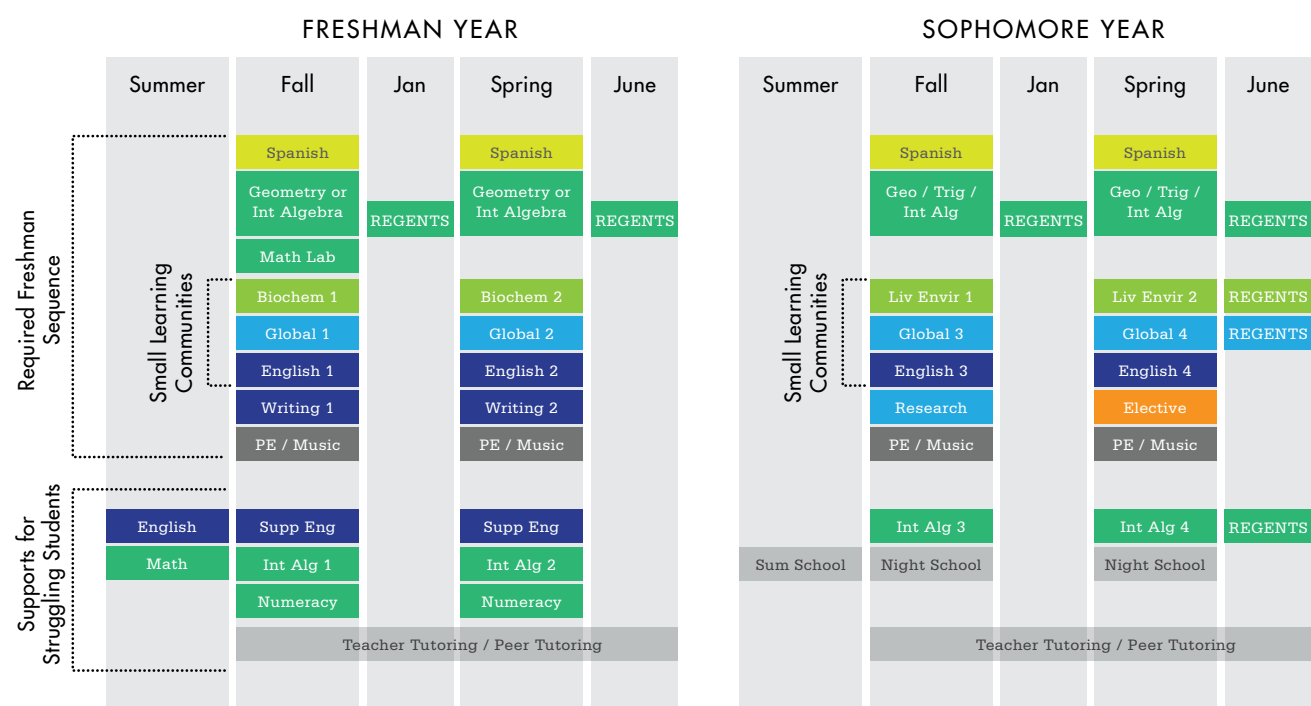
An intentionally prescribed curriculum, with very few deviations, defines the experiences of all freshmen and sophomores at Telly (Figure 2). The 9th-grade curriculum, in particular, is designed to pace students’ progress, familiarize them with the culture and expectations of the school, and focus on mastering skills rather than passing Regents exams at the end of the year. All freshmen take English, Writing, Global History, and Biochemistry, courses that emphasize literacy and strengthen writing and critical thinking skills. Ninth graders also take a full year of mathematics, Spanish, physical education, and music. The priority on skill building is supported by a key design decision: Telly allocates more teaching power to the freshman year by making 9th-grade classes smaller.

At the end of 9th grade, Telly students take only one Regents exam, in a math content area (Integrated Algebra or, for more advanced students, Geometry).¹⁴ In science, the Living Environment course, which leads to a Regents exam, is not offered until students’ sophomore year,¹⁵ but students begin to build science mastery in 9th grade with biochemistry.

In sophomore year, students deepen and expand their core writing skills and continue to build foundational literacy and critical thinking skills. They also begin to develop research and presentation skills in the Global History course. The sophomore year culminates in two Regents exams, Global History and Living Environment. To be considered on track to graduate, students must have accumulated twenty-two credits, most of them in core subject areas, by the end of 10th grade.

The curriculum in the junior and senior years provides opportunities to create more customized schedules through electives, yet Telly continues to prescribe courses deemed prerequisites for postsecondary work. In 11th grade, intensive college advising takes on heightened importance, and college preparatory work is woven into the curriculum. A college essay is an expected deliverable in the sixth semester of English, and the college office works with teachers in the required 11th-grade U.S. History course to discuss college visits, financial aid, and the application process. Telly makes an effort to program all seniors, especially those who have not taken an Advanced Placement course, into at least one College Now course.¹⁶

Figure 2. Core Curriculum in Freshman and Sophomore Years



Student Trajectories: The Pathways

Despite its efforts to pace student progress, Telly recognizes that students enter with different levels of skills and knowledge and master new challenges at different speeds. The school has therefore created complex systems for determining where students are on the trajectory to graduation, scheduling them into courses that enable them to move to higher levels, ensuring that courses and materials are aligned with Regents exams, and maximizing proximal testing dates. The school works hard to ensure that students are not denied opportunities to progress because of poor scheduling or programming decisions.

In mathematics, for example, students enter with vastly different levels of math proficiency as measured by 8th-grade state math exams. The majority enter with no previous exposure to algebra—yet some have earned credits in Integrated Algebra in middle school and scored high enough on the Regents exam (80 or above) to bypass math remediation in the CUNY system. Telly’s math options over four years (Figure 3) accommodate the full range of possibilities.

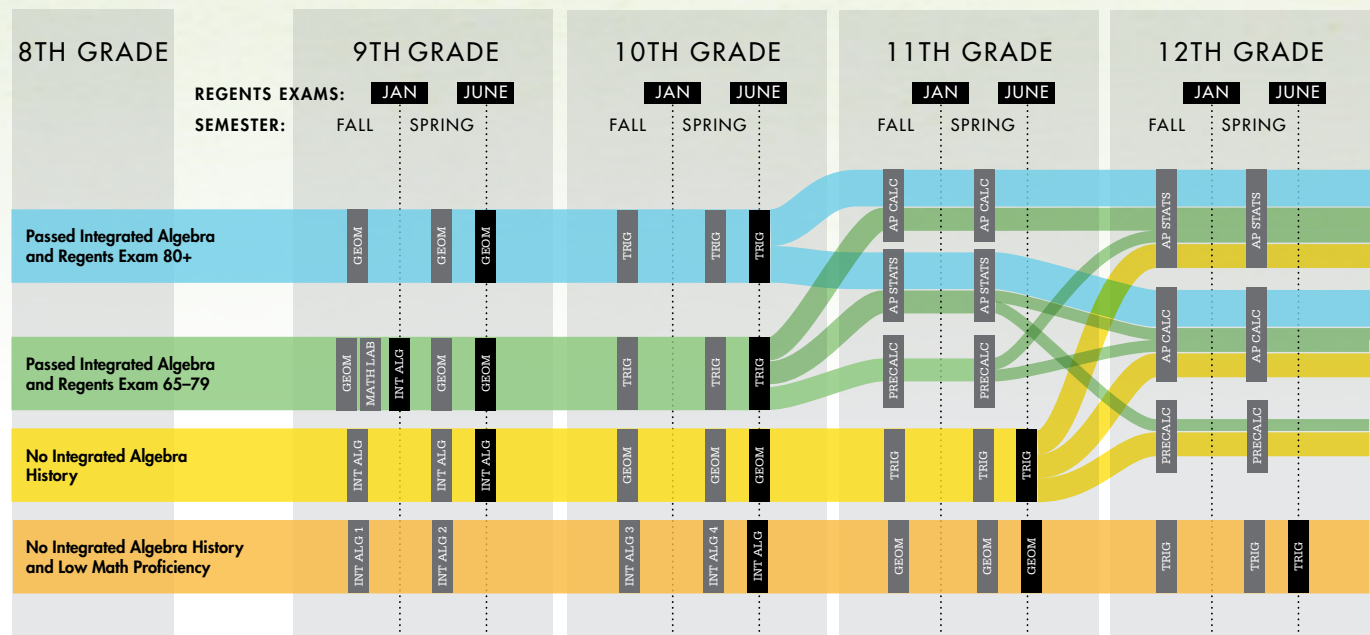
In fact, relatively few students will travel these trajectories smoothly from beginning to end. At the end of 10th grade, for example, students’ performance in three math courses (Integrated Algebra, Geometry, and Algebra 2/Trig) can generate ten different

outcomes (Figure 4). These pathways represent the potential for variability within a cohort of students, which can have far-reaching implications for how a school allocates its limited resources of faculty and space to meet student needs. The school must also consider the number, or density, of students traveling on each pathway, as represented by narrow or wide bands.

Responding to the variability and density of student pathways presents educators with a conundrum. If they strive to address variability in students’ needs, how do they establish and maintain curricular coherence for the cohort overall? On the other hand, if they are not sensitive enough to variability and teach to the majority, some students may fall so far behind that they disengage, creating a different set of resource allocation challenges as graduation nears.

For freshmen and sophomores, Telly has attempted to manage variability and density simultaneously by establishing small learning communities through which the curriculum is administered broadly to all students.¹⁷ The communities are social structures that allow high-need students to be grouped efficiently and strategically, while also positioning teachers to manage and support students’ day-to-day academic behaviors.¹⁸

Figure 3. Mathematics Course Options over Four Years at Telly



Steady Support and Skill Building: The Steps

Telly divides its 9th and 10th graders into three small learning communities (SLCs), each made up of about a hundred students who are assigned to a team of three core subject area teachers in English, global history, and science. The communities are designed to prepare all students for steady success throughout high school while simultaneously preventing at-risk students from beginning an early downward spiral. Each SLC is structured to foster a small-school atmosphere and a more personalized learning environment for students, particularly younger students who might struggle with the transition to high school.

Telly’s SLCs enable teachers to focus on a shared group of students and to compare notes on each student’s academic progress within and across subject areas. “Kids know very quickly that if something happens in one class, the teacher from their other class is going to know about it, and that can work really well,” said former principal Phil Weinberg. “If a kid is acting up in one class but has a good relationship with a teacher in another, that teacher might say, ‘Come on, you’ve got to get it together in that other class. I know what you can do.’ The kids know that their teachers are watching them and talking about them, and they know that the teachers meet every day.”¹⁹

Telly uses the SLC structure to help manage student variability. Incoming students with identified special needs are grouped and

placed alongside general education students, creating what we call “strategic density.” For instance, almost a tenth of Telly’s incoming students require certain types of intensive, integrated special education services such as integrated collaborative teaching (ICT).²⁰ These students are combined with mainstream students in one small learning community (**Figure 5**), and their core teachers are paired with ICT instructors. Likewise, English-language learners (ELL) are combined with general education students in one community, and with students needing extra literacy support in a third. High-performing (Honors) students are dispersed across all three groups, consistent with the school’s commitment to heterogeneity. Teachers in each community have the skills needed to deliver the curriculum to all their students, but they also have specialized skills to address the particular needs of their higher-need students.²¹ This structure reflects a pervasive school philosophy: that students and teachers do better in heterogeneous, thoughtfully organized groups.

In addition to making intentional grouping decisions, Telly addresses individual students’ needs by placing educators strategically to provide ongoing support. A grade advisor, a teacher with a reduced teaching load, is assigned to each incoming cohort of 9th-grade students and stays with those students for the next four years. Grade advisors monitor and guide the steps

Figure 4. Potential Outcomes for 10th-Grade Students in Mathematics

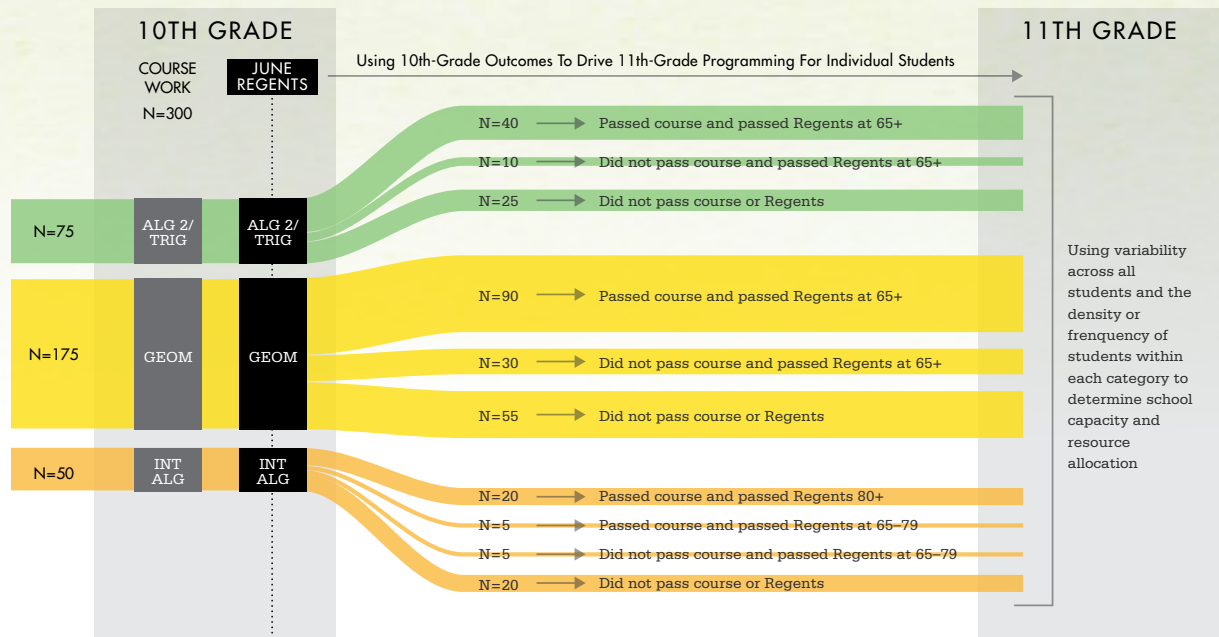
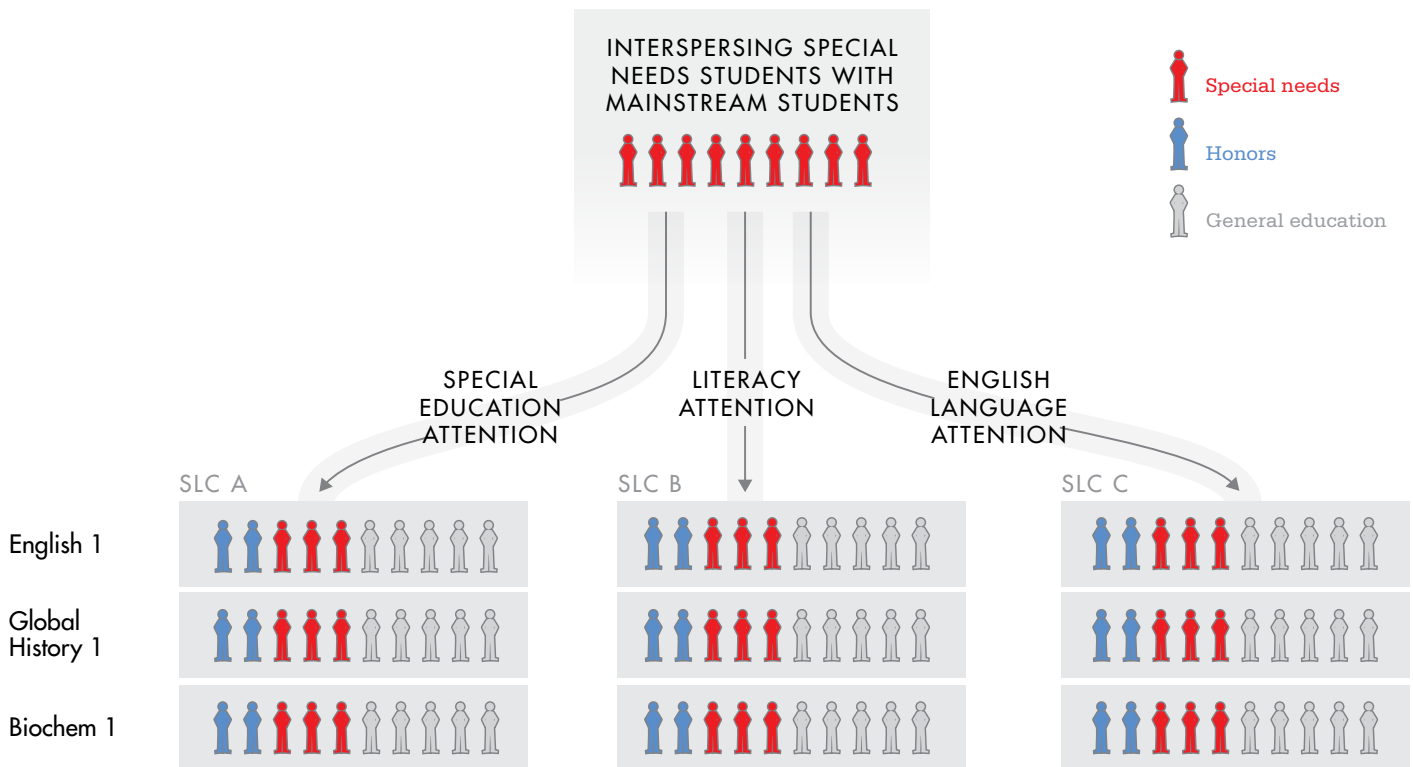


Figure 5. Creating Strategic Density: Placing Students with Specific Needs in Three Small Learning Communities



that contribute to students' academic growth, paying particular attention to attendance, marking-period grades, and semester grades and engaging students, parents, and faculty as needed. The school's four grade advisors represent an important investment; collectively, the reductions in their teaching loads are equivalent to almost two full-time teachers.²² The school reasons that the grade advisors allow the school's two guidance counselors to focus almost solely on students' socio-emotional concerns, and that students benefit from having both a guidance counselor and a grade advisor who know them well.

Telly's structures are intentionally designed to capture granular student data from various angles. Core teachers see students within and across different classroom environments and subject area experiences; their perspectives are juxtaposed against the grade advisor's individual student perspective. Using an inquiry process, teachers and grade advisors meet at least three times a week (and

often more frequently) to discuss students' work, their developing skills, and behaviors that may be interfering with or facilitating the acquisition of those skills.²³ Student proficiency is broken down by standards and then narrowly analyzed at the skill level to determine what students need to do to demonstrate mastery.

By superimposing these varied perspectives, Telly's structures create a "continuous present,"²⁴ or an unfolding of a student's day-to-day academic trajectory in which blind spots in one educator's vantage are covered by another, enabling the team to identify barriers to success and design interventions to help students stay on track. Indeed, the strategic positioning of educators around the student fosters a vigilant, collective awareness that goes beyond conventional early-warning indicators that a student is at risk. Telly's "constant awareness"²⁵ is an authentic form of early warning, and educators are at the heart of it, woven together in a human safety net that supports students and fosters collaboration and shared learning among teachers.

ORGANIZATIONAL STRUCTURE THAT SUPPORTS EDUCATORS

Telly's educators are strategically positioned to help students reach and exceed their potential; they are also positioned to do the same for one another. In other words, to shape student trajectories, Telly shapes teacher trajectories.

Telly's educators are part of a multilayered system of social structures: the leadership team (made up of the principal and assistant principals), department teams, grade teams, SLC grade advisors, guidance counselors, the programming team, the dean's office, the testing coordination team, and college advisement teams. Each has a specific function and therefore sees the school from a distinctive vantage. All intersect at one point: the teacher. By design, these multiple perspectives on the progress of students and the overall functioning of the school, which educators frequently discuss and share, fill gaps and compensate for one another.

The teams fall along two broad dimensions, operational supports and instructional supports, with the leadership team straddling both. The operational supports create stability by minimizing turbulence that might otherwise disrupt the school and classroom environments. The instructional supports allow teachers to hone their craft and develop their teaching expertise.

Both sets of supports must accommodate the inherent instability of cohorts of students moving through the school from one year to the next while simultaneously creating stable conditions for the teaching workforce to be effective. In short, they strive for an oxymoronic state: dynamic stability.

“What we could not have anticipated was how these structures would take care of teachers over time. [Teaching] is a very individual profession in a way that doesn't make any sense. The creation of a community for those adults is a big, big deal.”

—Former principal, Phil Weinberg

Telly's many design decisions have produced systems and structures—most notably the SLCs for students in grades 9 and 10—that enable students and educators to achieve impressive results. Most broadly, the school's four-year graduation rates have been high, exceeding 80 percent over the past several years and surpassing the performance of its peer schools and the citywide average.²⁶ Its weighted diploma rate, a measure New York City has devised to evaluate the rigor of the diplomas schools award, places Telly in the 80th to 90th percentile relative to its peer schools in each of the last three years. Telly's scores on postsecondary metrics, including its graduates' enrollment in postsecondary education after six months and after eighteen months, are also well above average for both its peer group and the city as a whole.

Telly has also shown strength in its capacity to support students in accumulating high school credits and passing Regents exams (Appendix A). Over the last three years, Telly's scores on all six

New York City credit accumulation metrics have consistently been above average, outperforming similar schools seventeen out of eighteen possible times.²⁷ Its average Regents completion rate, which measures students' progress toward completing the five required Regents exams, has exceeded peer and citywide rates in each of the last three years.

Results such as these are the public and visible manifestations of patterns of performance that arise from the school's systems and structures. Yet it is also important to recognize that graduation and course completion rates are the aggregate outcomes of countless, far less visible interactions that occur daily over the course of four years. For a school such as Telly, design-based decision making and the strategic use of data are tools for drawing connections among those interactions and seeing patterns within the information—connections and patterns that, in turn, enable teachers to make their own work more effective and serve students better.

STOCK-AND-FLOW:

VISUALIZING STUDENTS' DIVERGENT PATHWAYS

The implications of Telly's design-based decision making

are easier to see in the stock-and-flow map for the 2013 graduating class (**Figure 6**; see also Appendix B for information on how New Visions student performance categories are defined). The stock-and-flow tool, designed by New Visions and Legible Data, graphically illustrates students' trajectories toward graduation across four years of high school. Student achievement is shown in terms of both "stock," or point-in-time accumulation of students at each performance level, and "flow," or movement of student performance between levels across time. The diagram shows how students' risk profiles change from one semester to the next, providing detailed information about when shifts in performance actually happen, their direction, and the number of students affected. In this way, stock-and-flow allows us to visualize how students drain out of and fill up different achievement groups or performance categories at different moments in time.

In September 2009, 297 students entered Telly as 9th graders. Their incoming high school performance categories, shown at the left side of this map, were based on their 8th-grade New York State English and math exam scores. The map shows their performance over the next four years, through summer 2013, when 82.5 percent of them graduated with Advanced Regents, Regents, or local diplomas, as shown at right. Their performance is tracked across all eight semesters of their high school careers and the three annual administrations of Regents exams, in January, June, and August.

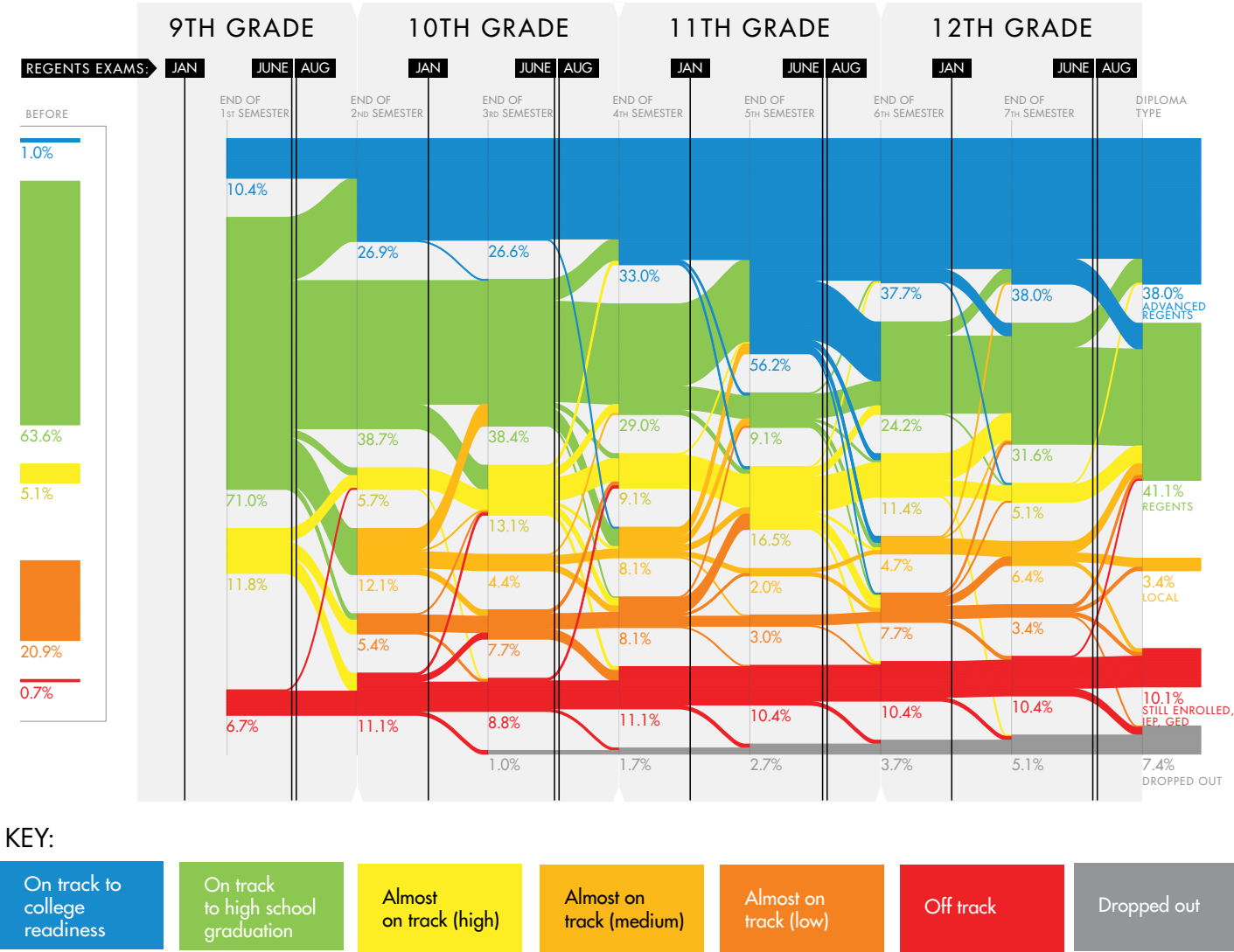
Students' assignments to performance categories are reassessed at the beginning of each semester, reflecting New Visions' experience of what it means for a student to be on track to graduation or college readiness. (Specific expectations for credit accumulation and Regents passing are detailed in Appendix B.)

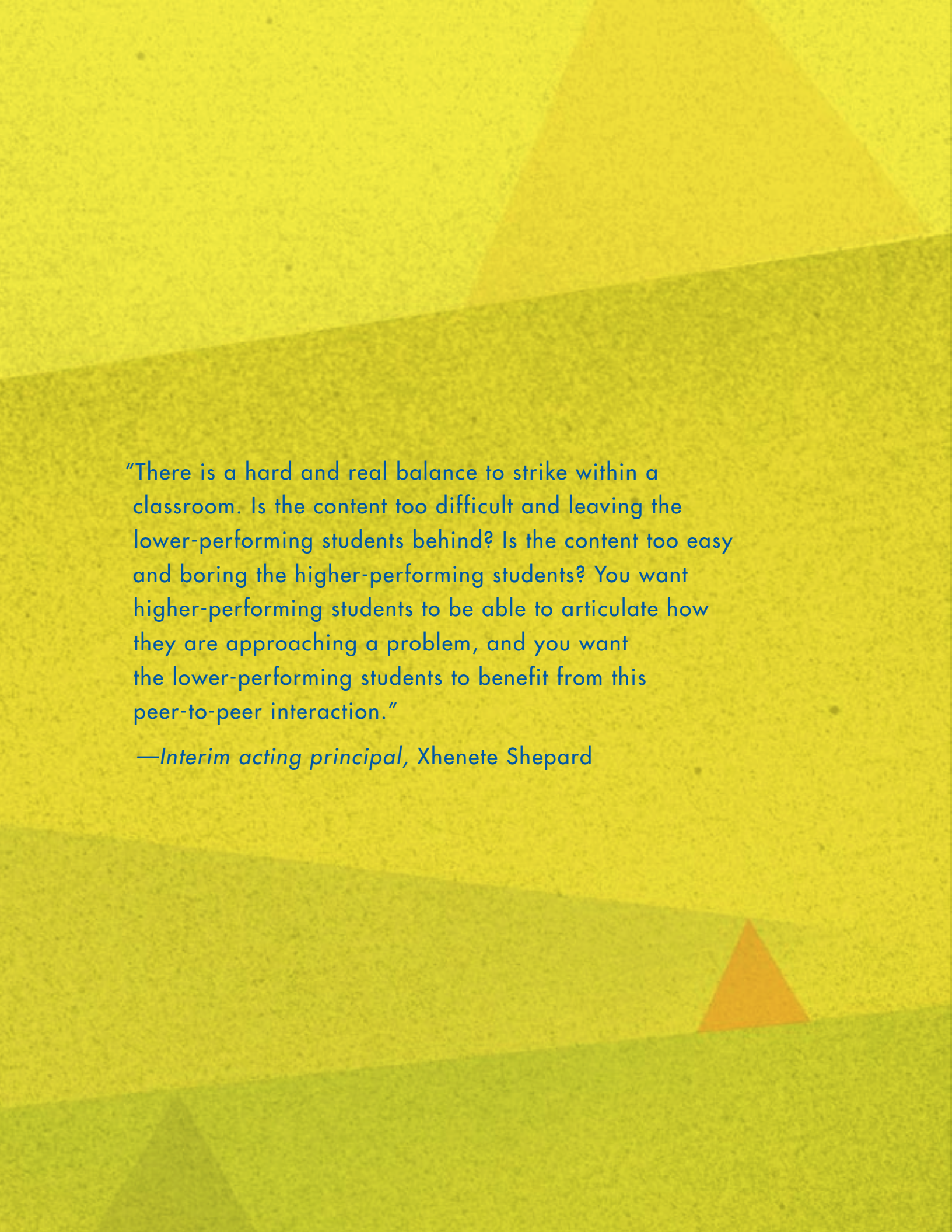
The width of each color band represents the percentage of students in that performance category. For an in-depth discussion of how New Visions and its schools use stock-and-flow maps to understand and respond to patterns of student performance, see Fairchild et al. 2012.

HOW TO READ THE STOCK-AND-FLOW GRAPHICS

1. Colors indicate student achievement based on New Visions' "progress to graduation" metric, which assigns a category to each student based on his or her credit accumulation and New York State Regents exam scores. (See Appendix B for details.)
2. The "Before" column illustrates performance of incoming 9th-grade students, based on students' 8th-grade standardized test scores in English Language Arts and mathematics.
3. The administration of Regents examinations (three times yearly) is indicated in black.
4. The width of each color band (or, "stock") represents the proportion of students within a performance category, as calculated at the end of each semester using New Visions' metric.
5. The movement of students among different performance categories (or, "flow") is captured between semesters.

Figure 6. Visualizing Student Need: New Visions Stock-and-Flow Map for Telly's 2013 Cohort



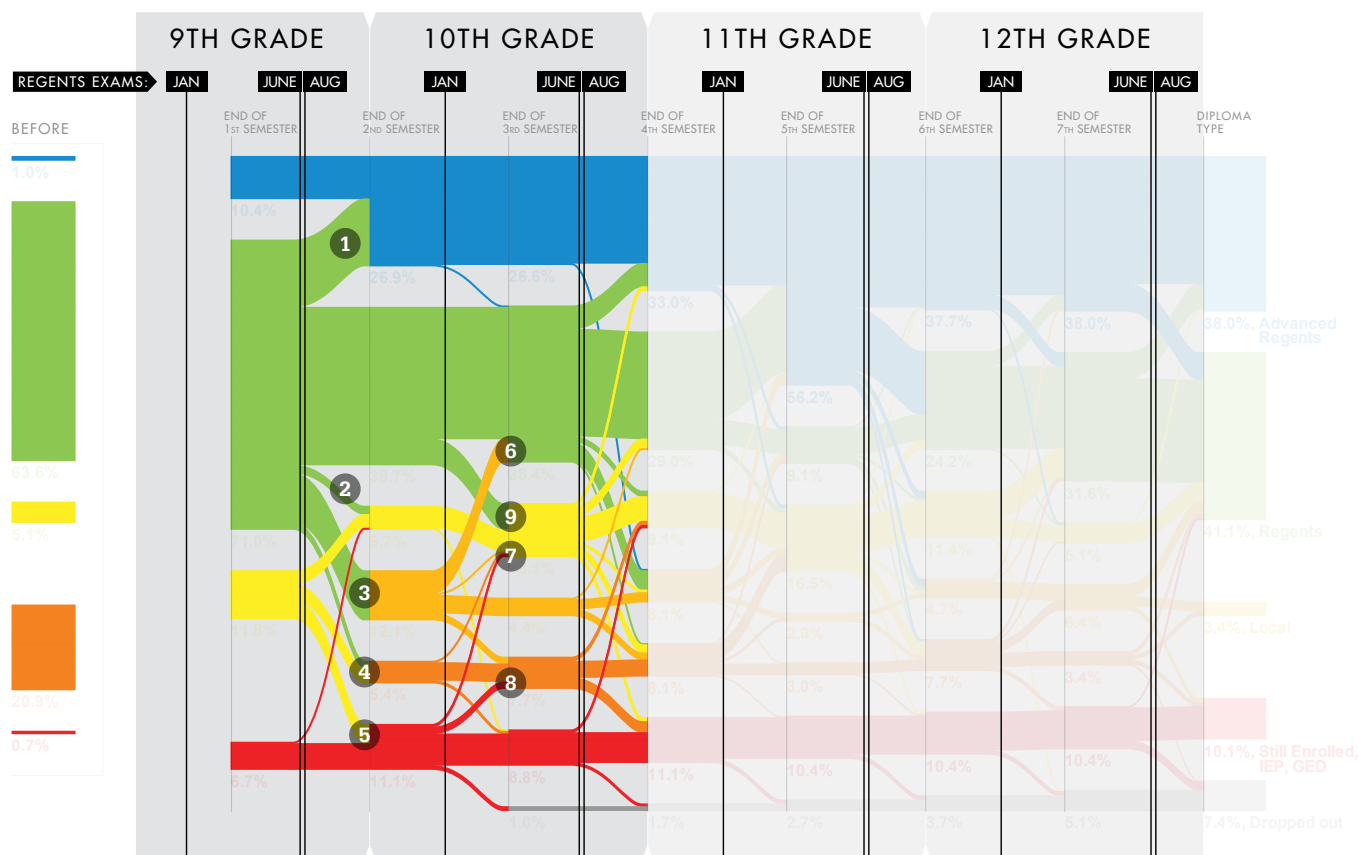
The background features a series of overlapping, semi-transparent geometric shapes. A large yellow triangle is positioned in the upper right, while a green triangle is in the lower right. The rest of the background is composed of various shades of yellow and green, creating a layered, abstract effect.

"There is a hard and real balance to strike within a classroom. Is the content too difficult and leaving the lower-performing students behind? Is the content too easy and boring the higher-performing students? You want higher-performing students to be able to articulate how they are approaching a problem, and you want the lower-performing students to benefit from this peer-to-peer interaction."

—*Interim acting principal, Xhenete Shepard*

In September 2009, Telly's 2013 cohort arrived as 9th graders and were assigned to small learning communities of approximately one hundred students each. Most had performance records that placed them at the on-track level, indicating that—provided they made steady progress in accumulating course credits and passing required Regents exams—they were likely to graduate on time four years later. For many students, however, the path to graduation is not straight. In addition to students' own work and determination, getting to graduation requires careful attention, support, and sometimes intervention by teachers and other educators.

Figure 7. Student Performance Flows in Grades 9 and 10, Cohort 2013



The movement of students into lower performance categories does not go unanswered by educators at Telly. By the end of the first semester of 10th grade, when students have had an opportunity to make up course failures and retake the Regents exam, Telly has moved a small number of students back up into higher performance categories (**Figure 7**). Flow 6, for example, shows students who caught up in both credits and the Regents exam, and flows 7 and 8 show students who caught up in credits but were still behind in Regents. A small subgroup of students (flow 9) move into a lower performance category because they are not keeping pace with passing courses and accumulating credits.

To be considered on track by the end of grade 10, students should have taken two additional Regents exams, Living Environment and Global History, and enough courses to accumulate at least twenty-two credits. Not surprisingly, their performance is even more widely divergent than it was at the end of grade 9 (**Figure 8**). Overall, students at the highest level have maintained their performance over their first two years of high school, and a fairly sizable group of students have shifted up from the green category to the blue. Yet

approximately 10 percent of students will enter their junior year in the yellow band because they are short of credits, 10 percent will be in the orange band because they have failed a Regents exam, and 10 percent will be in the dark orange band because they are behind in both credits and Regents. The 10 percent of students in the red category are seriously off track and will have a very difficult time meeting graduation requirements.

Telly's flagship intervention, the SLC structure, runs its course. But when the intervention ends, the data produced at the end of 10th grade represents an entirely different pattern than in previous semesters—a visual tangle, with multiple students being reassigned to higher and lower categories. What this suggests is that, up to this point, Telly has been quite successful at managing to the density of student performance by focusing on maintaining the forward momentum of large clusters of students, but less successful at managing to the variability of student need. Within a narrowing window of time, the school must now shift gears and manage more explicitly to the variability of student need.

Figure 8. Variability in Student Performance at the End of Grade 10, Cohort 2013

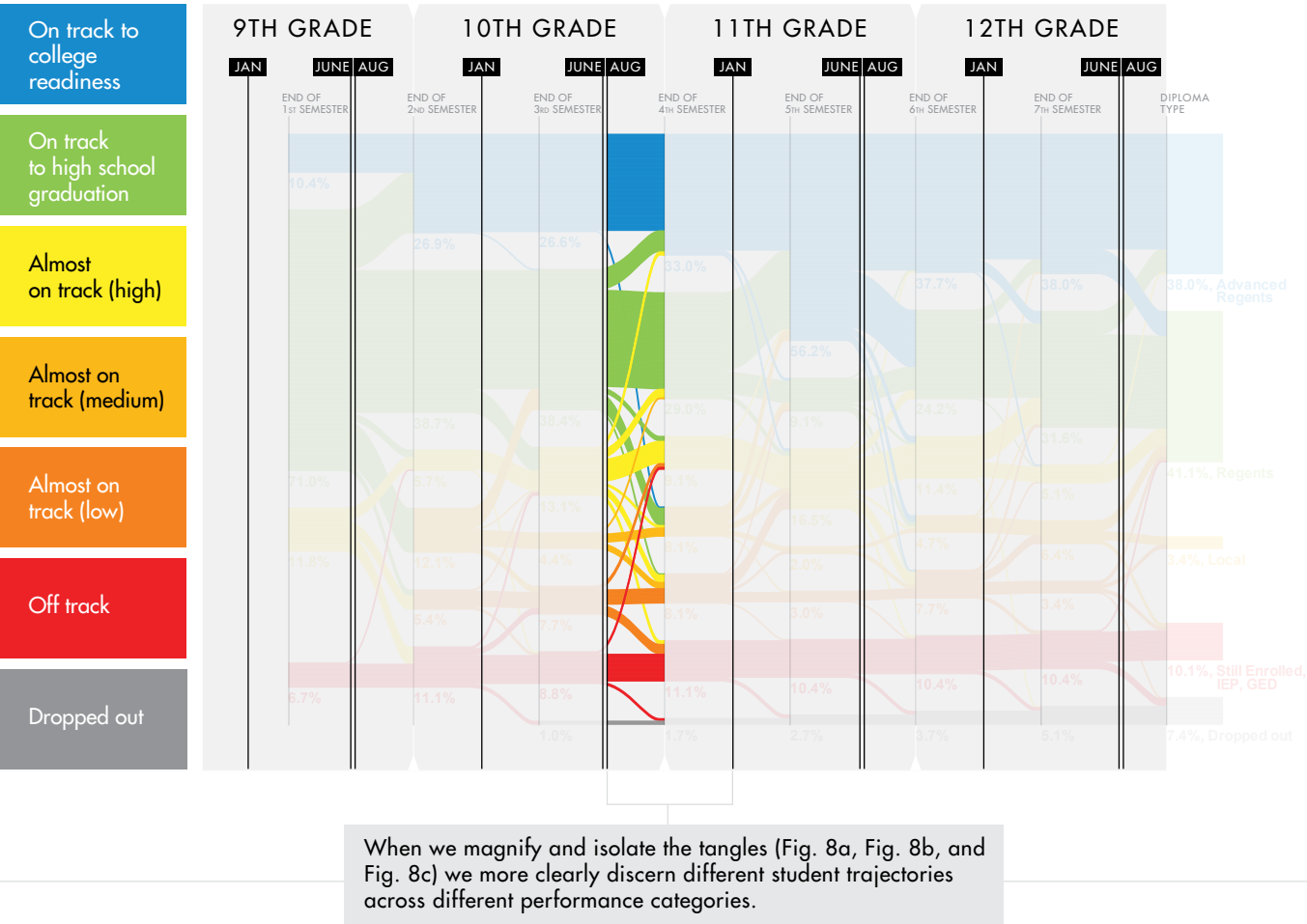
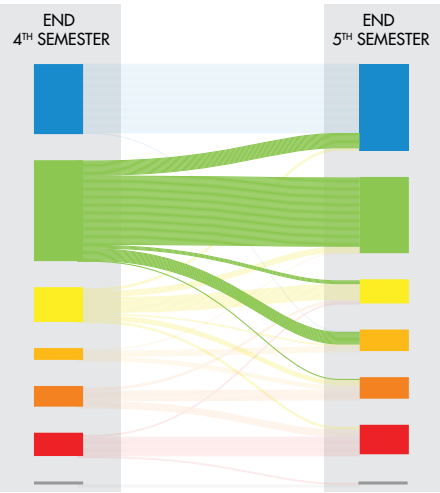
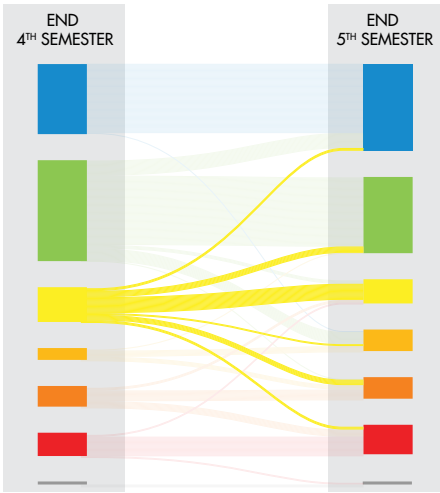


FIG. 8A PATHWAYS OF ON-TRACK STUDENTS



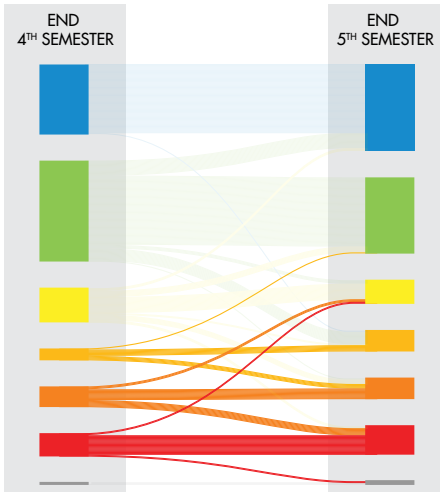
Approximately equal numbers of students move into higher and lower performance levels from the on-track-to-graduate category (green).

FIG. 8B PATHWAYS OF ALMOST-ON-TRACK STUDENTS



Students in the almost-on-track category (yellow) move in six different strands, illustrating the wide range of variability for this group at this time.

FIG. 8C PATHWAYS OF OFF-TRACK STUDENTS



Students in the lowest performance categories (orange, dark orange, and red) show limited upward movement, and their risk of dropping out is great from this point on.

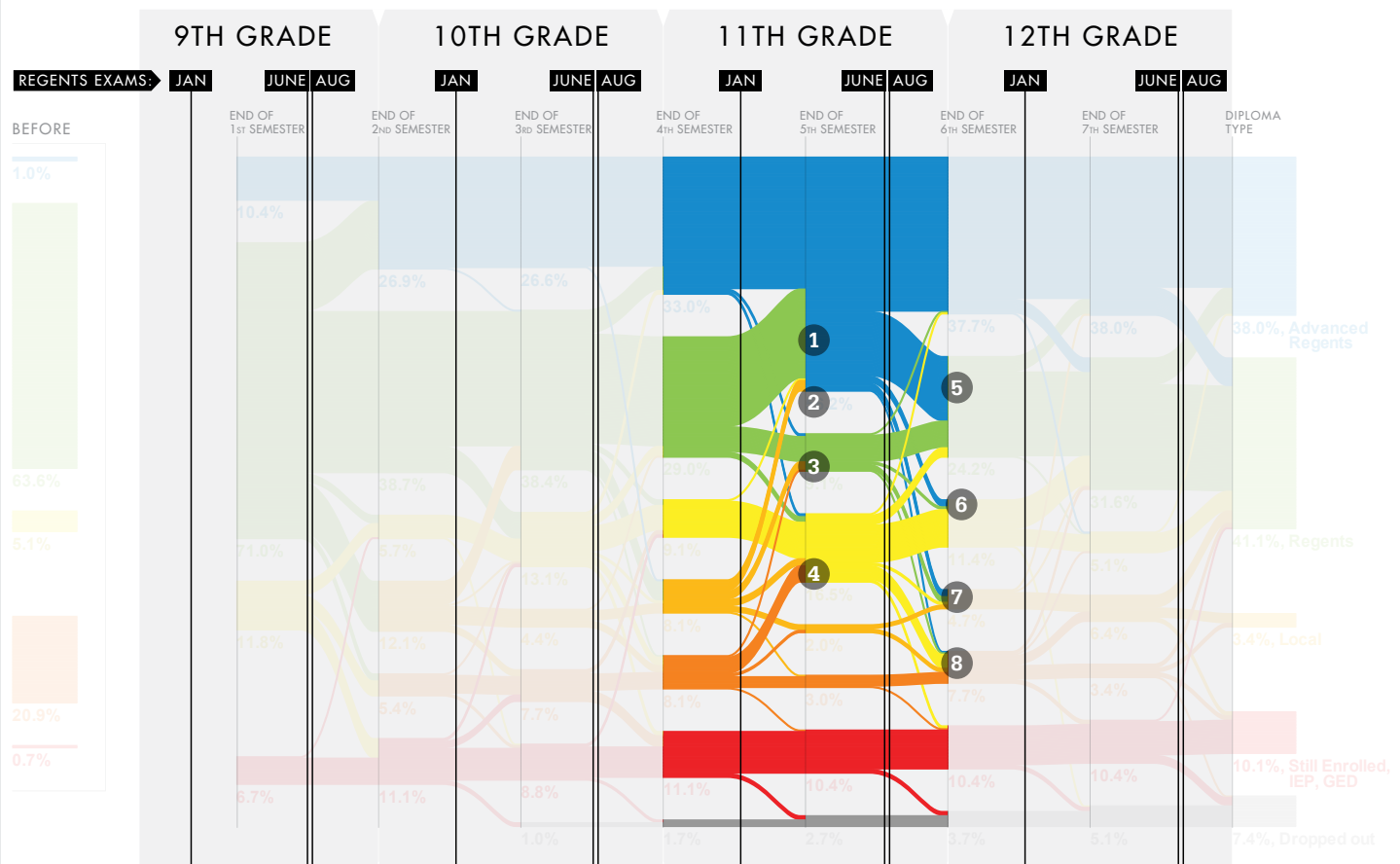
Grades 11 and 12: Managing for Student Variability with Strategic Grouping

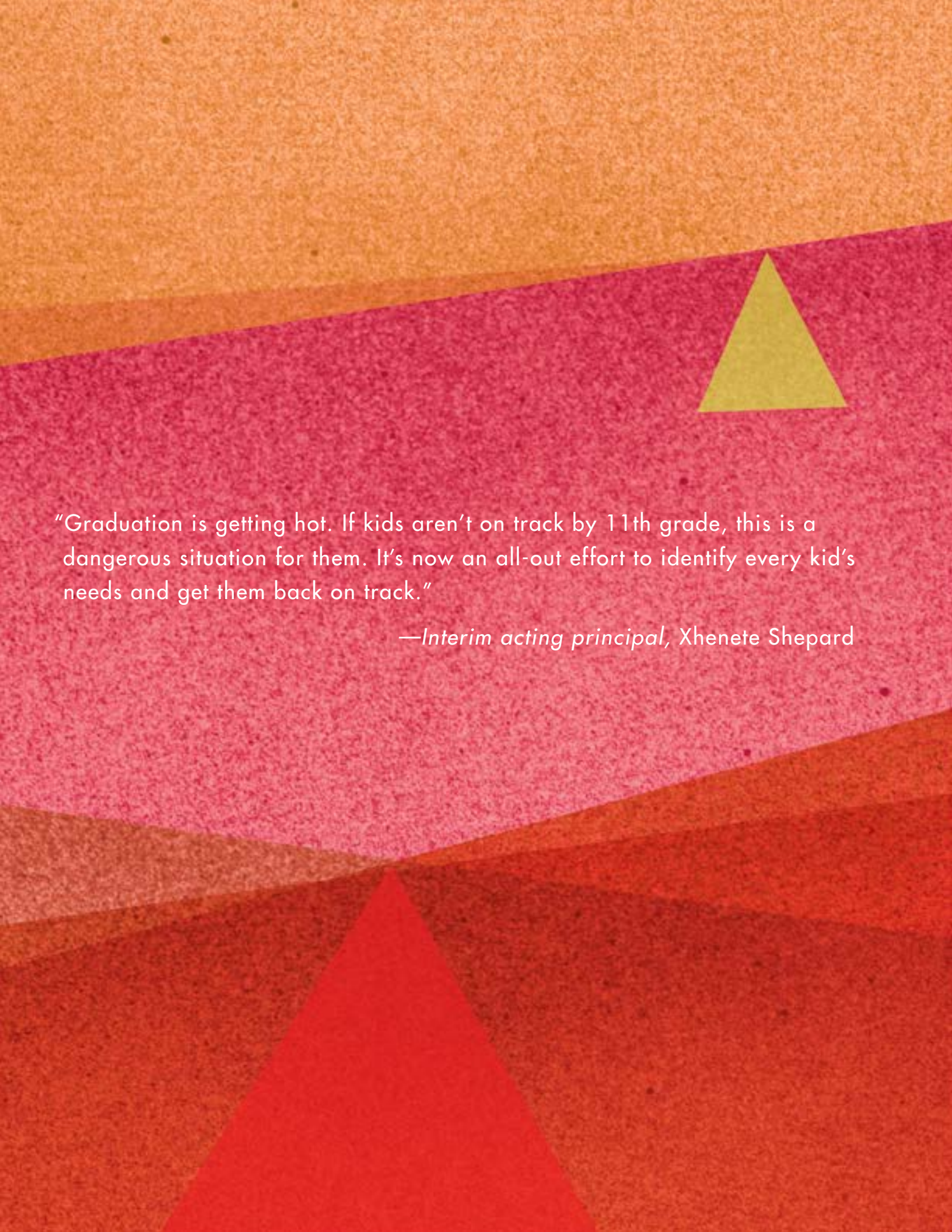
Once the two-year SLC structure ends and students advance to 11th grade, Telly’s strategies shift to give greater and more explicit attention to managing for variability in students’ individual needs, as indicated by the increasingly frequent flow of data regarding students’ success or failure in meeting the requirements for graduation and college readiness. During students’ junior and senior years, even as educators give priority to individual student needs, they continue to look for opportunities to create density by grouping students strategically. Teachers assigned to work with smaller groups focus on filling specific gaps in students’ content knowledge or skills, covering areas where students did poorly on Regents exams or failed particular course units, and designing assignments that build mastery.

There is significant movement at the end of the first semester of 11th grade (Figure 9), as students rise from lower performance categories into higher ones (flows 1–4). In general, these improvements are possible because students retake the January Regents and earn passing or higher scores.

The picture changes again in the second half of the junior year, as the intensifying demands of graduation and college readiness take hold. To be considered on track to graduate (green band), students need to have passed five Regents exams with scores of 65 or higher by the end of that year. To be on track for college readiness (blue band), they must meet even steeper requirements: two additional Regents exams, including exam scores of 75 or above in English and 80 or above in math. At this point, almost 20 percent of blue-band students drain out into lower performance categories, many because they have not met those extra requirements. Most shift into the green band (flow 5), but small strands drain into the yellow and orange bands (flows 6–8), highlighting the potential for variability even among students performing at high levels. Small strands of students in the on-track and almost-on-track categories drop into lower performance brackets, often because they are not keeping pace with Regents requirements or are slipping even further behind in both credit accumulation and in Regents passage.

Figure 9. Student Performance Flows in Grade 11, Cohort 2013



The background is an abstract composition of layered, textured paper in shades of orange, pink, and red. A bright yellow-green triangle is positioned in the upper right, and a solid red triangle is in the lower left.

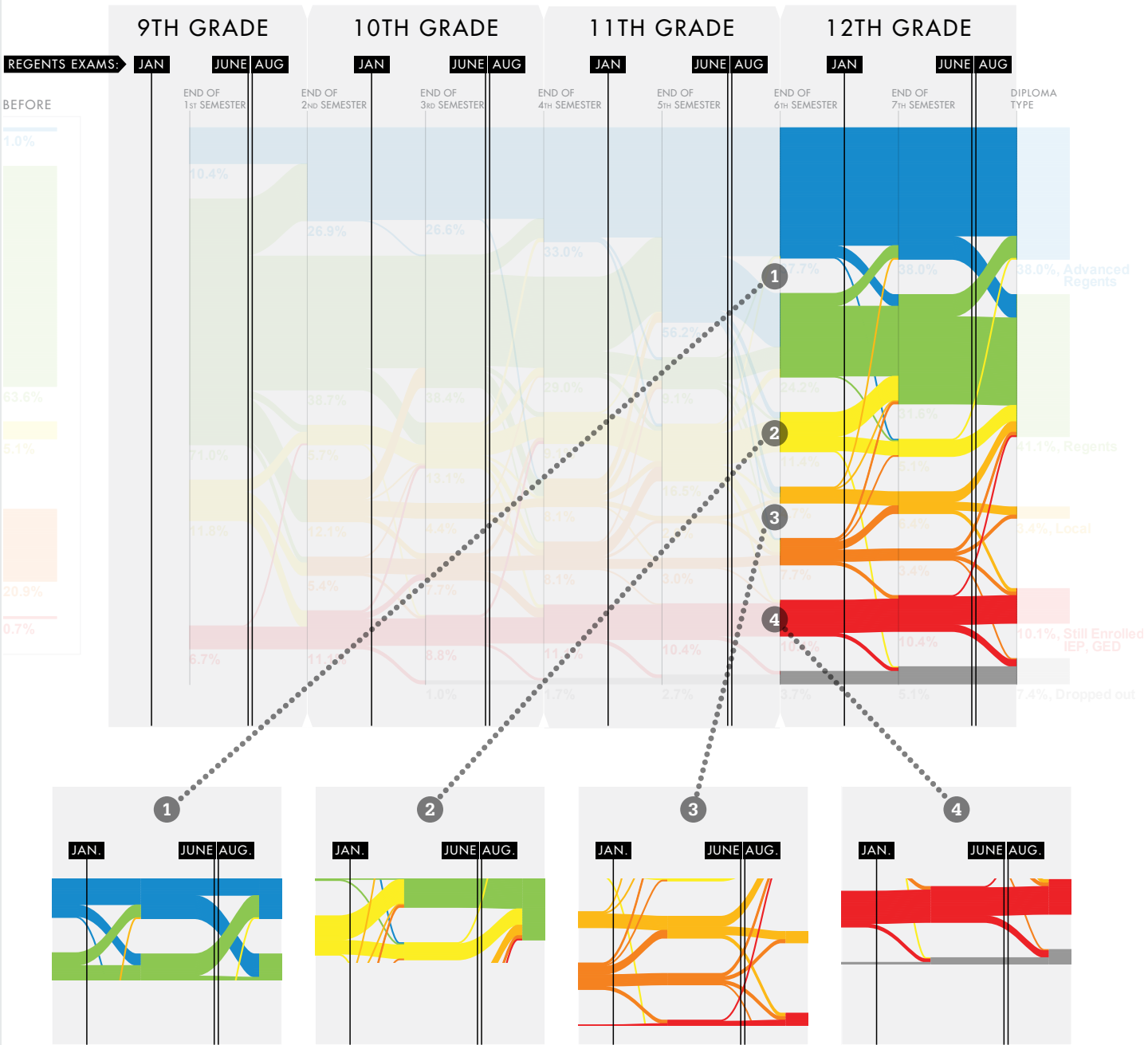
“Graduation is getting hot. If kids aren’t on track by 11th grade, this is a dangerous situation for them. It’s now an all-out effort to identify every kid’s needs and get them back on track.”

—*Interim acting principal, Xhenete Shepard*

The final push comes in grade 12 (Figure 10), as graduation nears. As the 2013 cohort moved into their senior year, there was a crisscrossing pattern between the two highest-performing groups (pattern 1) and noticeable upsurges of students from the almost-on-track yellow and orange bands to higher bands (pattern 2). The splayed performance pattern among students in the dark orange band (pattern 3) signals the diversity of their needs: some will

graduate with a Regents or local diploma, some will not graduate and will remain enrolled at Telly for another year, and some will drop out. And if Telly educators have mixed success with improving the performance of students who fall within the darker orange band, they struggle most with moving the off-track students to higher levels (pattern 4).

Figure 10. Performance Patterns Between Semesters 6 and 8, Cohort 2013

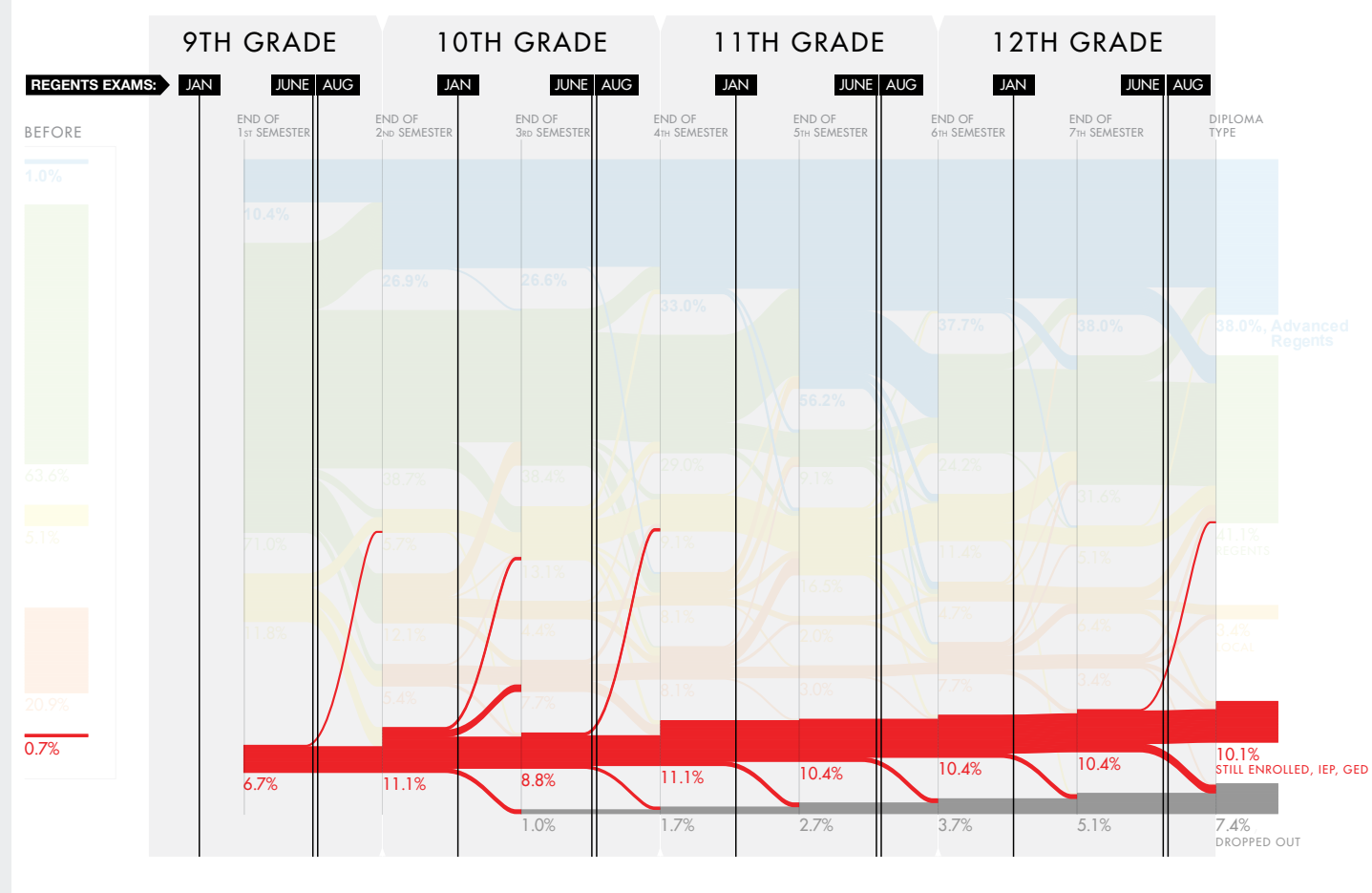


TELLY'S WEAKNESS: OFF-TRACK STUDENTS

Although Telly consistently graduates 80 percent or more of its students, many with rigorous Advanced Regents diplomas, its record of success excludes one fairly sizable group: the chronically low-performing students who make up the red band on New Visions' stock-and-flow map. Many of these students are already performing below grade level when they enter high school, and others join their ranks, particularly in grades 11 and 12. Once there, few of these struggling students improve their performance enough to shift to higher bands. Instead, they tend either to drop out or to remain enrolled in high school beyond four years. Clearly, Telly's efforts to manage and meet variable student need fall short with this particular population.

Because Telly has pushed the boundaries of success, this problem stands out, yet Telly is not alone. This pattern of performance is pervasive across many American high schools and districts; it reflects an urgent, ongoing need to find new ways to support struggling students with effective instruction and other supports that increase their chances of success in the workforce and in postsecondary education, which is increasingly necessary for rewarding, secure employment.

Figure 11. Off-Track Students over Four Years



LESSONS FOR SUPPORTING STUDENT SUCCESS

By approaching Telly through the dual lenses of design

and data, we see that its educators use both mental models and a deep understanding of student performance to create and sustain systems that produce strong results. Educators' essential, core beliefs are molded within school structures—the curricular landscape, programmatic pathways, and foundational steps—that help them work effectively to enable so many of their students to succeed. Their design- and data-driven choices are anything but simple, and their ongoing work is too complex to be labeled, packaged, and passed off as “best practice” in a conventional way.

Telly's efforts point to complex lessons about using design and data simultaneously to support students in reaching the goals of high school graduation and college readiness:

- **Provide students with strong, personalized support in the early years, as they develop and strengthen fundamental skills.** By placing all students in small learning communities in their first two years and building in “strategic density” for high-need students, Telly ensures that students are well known to their teachers and grade advisors and receive targeted instruction and steady guidance as they acclimate to the demands of high school.
- **Intensify focus on the variability of students' strengths and needs as graduation nears.** Telly's programming enables more than four out of five students to graduate on time and an unusually large share—38 percent of the 2013 cohort—to earn the designation “college ready,” as signified by receiving an Advanced Regents diploma and surpassing CUNY threshold scores for remediation. The vigilance of Telly's educators, who scan data on credit accumulation and Regents scores for signs that a student is slipping or that a higher-level diploma is within reach, helps many students stay on track and cross the finish line.
- **Create social structures that provide educators with feedback on student performance and enable them to act quickly on students' behalf.** Telly reinforces the power of the SLC structure for students by designing systems that support educators. At Telly, 9th- and 10th-grade teachers are in near-continuous dialogue, and opportunities for communication among teachers and across teams are many. The culture of vigilance carries into grades 11 and 12, as teachers, grade advisors, and other school staff work together to ensure that students get the support they need to meet the requirements for graduation.

Telly is a school that attends to its present; its educators recognize both the immediacy and the power of what happens today. They understand that small errors accumulate when left unattended, and that small victories add up to larger accomplishments. Their collective state of alertness is the product of an intentionally designed system of constant awareness of the small, granular details—the data—of where students are on the path to graduation and their postsecondary futures.

Data and design skills are related but not interchangeable: a school may design what appear to be good systems but fail to use data continuously to understand how well the students are doing, or a school may examine student data closely but fail to use it intelligently to design systems that support students and educators alike. Authentic best practice keeps design and data in balance, with educators working intentionally both above and below the “waterline” (extending the metaphor of the iceberg model), making fundamental design decisions, staying aware of student trajectories, and rigorously examining data on student performance for opportunities to help students succeed.

“Everybody is awake. There are grade advisors checking. There are teachers checking. We do progress reports twice a term. There are meetings with assistant principals if X number of students are failing. It’s not about ‘You’re doing the wrong thing’ but ‘What’s going on?’ We lose track of some students when we focus on others, and then we try to refocus and gain them back. We are looking, and we are regularly looking.”

—*Assistant principal, Jeanine Boulay*

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APPENDIX A

In its High School Progress Reports, the New York City Department of Education holds schools accountable on six separate credit accumulation measures: percentage of students earning ten or more credits each year in years one, two, and three, and percentage of students whose 8th-grade standardized test scores place them in the city's "lowest third"²⁸ and who earn ten or more credits each year in years one, two and three. Over the past three years, Telly has outperformed the city average each time in each category (eighteen times total) and its peer group seventeen times out of eighteen.²⁹

Table 1 shows how the school is faring in terms of students' credit accumulation as compared with similar schools and all schools in the city. A score of 50 percent would indicate that Telly falls in the middle of either peer schools or schools citywide; a score of 100 percent would put Telly at the top of the range. Telly scores especially high for students in their first year, but results for 2012 and 2013 show that by students' third year, the gap between Telly and other schools has narrowed, particularly for students in the school's lowest third.

Table 1. High School of Telecommunication Arts and Technology: Student Credit Accumulation, 2011–13

	Peer Percentage of Range			City Percentage of Range		
	2011	2012	2013	2011	2012	2013
PERCENTAGE OF STUDENTS EARNING 10+ CREDITS IN FIRST YEAR	78.4%	75.8%	79.3%	81.5%	80.2%	80.8%
PERCENTAGE OF STUDENTS IN SCHOOL'S LOWEST THIRD EARNING 10+ CREDITS IN FIRST YEAR	74.3%	66.3%	78.3%	72.3%	69.1%	72.7%
PERCENTAGE OF STUDENTS EARNING 10+ CREDITS IN SECOND YEAR	66.7%	68.4%	71.6%	70.0%	73.5%	73.5%
PERCENTAGE OF STUDENTS IN SCHOOL'S LOWEST THIRD EARNING 10+ CREDITS IN SECOND YEAR	55.8%	55.6%	69.4%	57.8%	60.2%	64.6%
PERCENTAGE OF STUDENTS EARNING 10+ CREDITS IN THIRD YEAR	80.6%	66.5%	61.0%	78.2%	68.1%	65.9%
PERCENTAGE OF STUDENTS IN SCHOOL'S LOWEST THIRD EARNING 10+ CREDITS IN THIRD YEAR	70.4%	54.5%	48.0%	69.4%	56.1%	51.4%

Source: New York City Department of Education Progress Reports

The NYC DOE Progress Report also holds schools accountable for Regents exam completion rates. As with credits, the categories "Peer Percentage of Range" and "City Percentage of Range" indicate how Telly scores relative to peer group and city schools. Table 2

shows that Telly consistently outperforms both peer group schools and citywide performance in its average Regents completion rate, which measures students' progress toward completing their five required Regents exams.³⁰

Table 2. High School of Telecommunication Arts and Technology: Average Regents Completion, 2011–13

	Peer Percentage of Range			City Percentage of Range		
	2011	2012	2013	2011	2012	2013
AVERAGE COMPLETION	78.9%	75.6%	59.1%	74.5%	74.5%	64.8%
ELA *	69.6%	66.9%	51.9%	76.4%	76.9%	60.0%
MATH *	84.6%	97.1%	87.2%	84.0%	100.0%	87.1%
SCIENCE *	47.4%	51.9%	66.3%	53.0%	56.4%	59.6%
GLOBAL HISTORY *	72.4%	65.4%	63.2%	78.9%	70.8%	66.0%
U.S. HISTORY *	60.4%	75.0%	44.0%	68.8%	81.8%	56.0%

Source: New York City Department of Education Progress Reports

APPENDIX B

New Visions Student Performance Categories, Semester-by-Semester Expectations

	Semester	1	2	3	4	5	6	7	8
On Track to College Readiness	Total Credits	5	11	16	22	27	33	38	44
	ELA Credits	1	2	3	4	5	6	7	8
	Social Studies Credits	1	2	3	4	5	6	7	8
	Math Credits	1	2	3	4	5	6	7	8
	Science Credits	1	2	3	4	5	6	7	8
	Art/Music Credits	0	0	0	0	0	0	1	2
	Foreign Language Credits	0	0	1	2	3	4	5	6
	Health/PE Credits	0.58	1.16	1.74	2.32	2.9	3.48	4.06	5
	Regents (Required 5)	1	1	1	3	3	5	5	5
	Regents (Additional 4)	0	0	0	0	0	2	2	4
College Readiness Scores on ELA (75+) and Math (80+) Regents		1	1	1	1	1	2	2	2

	Semester	1	2	3	4	5	6	7	8
On Track to Graduation	Total Credits	5	11	16	22	27	33	38	44
	ELA Credits	1	2	3	4	5	6	7	8
	Social Studies Credits	1	2	3	4	5	6	7	8
	Math Credits	1	2	3	4	5	6	6	6
	Science Credits	1	2	3	4	5	6	6	6
	Art/Music Credits	0	0	0	0	0	0	1	2
	Foreign Language Credits	0	0	0	0	0	0	1	2
	Health/PE Credits	0.58	1.16	1.74	2.32	2.9	3.48	4.06	5
	Regents (Required 5)	1	1	1	3	3	5	5	5
	Regents (Additional 4)	n/a							
College Readiness Scores on ELA (75+) and Math (80+) Regents		n/a							

	Semester	1	2	3	4	5	6	7	8
Almost On Track (High)	Total Credits	3	8	12	20	23	30	34	38
	ELA Credits	0	1	1	2	3	4	5	6
	Social Studies Credits	0	1	1	2	3	4	5	6
	Math Credits	0	1	1	1	1	2	3	4
	Science Credits	0	1	1	1	1	2	3	4
	Art/Music Credits	0	0	0	0	0	0	1	1
	Foreign Language Credits	n/a							
	Health/PE Credits	n/a							
	Regents (Required 5)	1	1	1	3	3	5	5	5
	Regents (Additional 4)	n/a							
College Readiness Scores on ELA (75+) and Math (80+) Regents		n/a							

Note: These students are meeting the On Track standard in Regents but not Credits.

	Semester	1	2	3	4	5	6	7	8
Almost On Track (Medium)	Total Credits	5	11	16	22	27	33	38	44
	ELA Credits	1	2	3	4	5	6	7	8
	Social Studies Credits	1	2	3	4	5	6	7	8
	Math Credits	1	2	3	4	5	6	6	6
	Science Credits	1	2	3	4	5	6	6	6
	Art/Music Credits	0	0	0	0	0	0	1	2
	Foreign Language Credits	0	0	0	0	0	0	1	2
	Health/PE Credits	0.58	1.16	1.74	2.32	2.9	3.48	4.06	5
	Regents (Required 5)	0	0	0	0	1	2	3	3
	Regents (Additional 4)	n/a							
College Readiness Scores on ELA (75+) and Math (80+) Regents		n/a							

Note: These students are meeting the On Track standard in Credits but not Regents.

	Semester	1	2	3	4	5	6	7	8
Almost On Track (Low)	Total Credits	3	8	12	20	23	30	34	38
	ELA Credits	0	1	1	2	3	4	5	6
	Social Studies Credits	0	1	1	2	3	4	5	6
	Math Credits	0	1	1	1	1	2	3	4
	Science Credits	0	1	1	1	1	2	3	4
	Art/Music Credits	0	0	0	0	0	0	1	1
	Foreign Language Credits	n/a							
	Health/PE Credits	n/a							
	Regents (Required 5)	0	0	0	0	1	2	3	3
	Regents (Additional 4)	n/a							
College Readiness Scores on ELA (75+) and Math (80+) Regents		n/a							

Note: These students are meeting the On Track standard in neither Credits nor Regents.

NOTES

¹ Marsh, Pane, and Hamilton 2006; Allensworth and Easton 2005.

² Talbert et al. 2012.

³ Fairchild, Scaramellino, et al. 2013; Fairchild, Gunton, et al. 2011.

⁴ Farrell 2013.

⁵ Bloom, Thompson, and Untermann 2010.

⁶ Fairchild and Soderquist 2013; Fairchild and Gunton 2014.

⁷ Bryk et al. 2010; Dunetz and Farrell 2014.

⁸ Bryk et al. 2010.

⁹ Dunetz and Farrell 2014.

¹⁰ Fairchild, Carrino, et al. 2012.

¹¹ Goodman 2002.

¹² The educational option admissions method is meant to create a normal distribution of students in the school, with approximately 16 percent of each incoming class achieving at the highest 8th-grade reading level, 68 percent achieving in the middle levels, and 16 percent achieving at the lowest reading level. See NYC Department of Education 2012a.

¹³ For more information on graduation requirements, including recent changes to requirements for the Advanced Regents Diploma, see New York City Department of Education 2013b.

¹⁴ There are some exceptions to this policy. For example, some students who enter freshman year having already earned credits in Integrated Algebra but who did not pass the Regents exam with a sufficiently high score to bypass CUNY remediation courses may be programmed into a Math Lab in addition to Geometry course and scheduled to retake the Regents exam in January of freshman year.

¹⁵ Most New Visions high schools program students for the Living Environment (biology) course during their freshman year.

¹⁶ College Now is a collaborative program between NYC DOE and the CUNY system. It is a dual enrollment program that allows current 11th- or 12th-grade public high school students to meet the requirements for high school graduation while simultaneously preparing for college. See “About College Now,” CUNY website, <http://collegenow.cuny.edu/about-college-now>.

¹⁷ Telly borrows from the small learning community (SLC) movement, favored by urban school districts such as New York and Los Angeles and funded by philanthropic institutions including the Bill and Melinda Gates Foundation and the Carnegie Corporation. Attempting to create more personalized learning environments for students, districts began breaking up large, underperforming high schools into SLCs, typically “schools within schools” that group students and teachers for four years, often around a common theme. Although Telly’s approach differs in that its students remain in the smaller grouping for only 9th and 10th grade, this report refers to these groupings as small learning communities.

¹⁸ Gunton 2013b.

¹⁹ Carrano 2013.

²⁰ Every student with an individualized education program (IEP) is automatically classified as “special education” (SPED). There are three categories of SPED students, who receive varying degrees of support. Some attend resource room one period per day, with no more than eight students, for which students receive no credit. Some are designated to receive integrated collaborative teaching (ICT) in a classroom team-taught by two teachers; no more than twelve SPED students can be assigned within a single ICT classroom. Students needing the most intensive support are assigned to self-contained SPED classrooms of no more than fifteen students in a grade and are typically taught the four core content areas (math, English, social studies, and science) within that environment.

²¹ Telly attempts to create SLCs of equivalent size, or approximately one hundred students per SLC. For example, of the three hundred incoming freshmen, thirty might be classified as needing ICT. Those thirty SPED students will be assigned to the SLC that is team-taught, along with seventy mainstream students. The school uses similar processes for forming SLCs focusing on students needing extra literacy support and English-language learners.

²² In general, New York City high school teachers have a teaching load of five courses; the four grade advisors at Telly teach three courses each, or a total of twelve courses.

²³ Inquiry is a cyclical process in which teachers work together to analyze student data, examine the rationale behind instructional decisions, implement improvements in classrooms, and study the results. See Talbert et al. 2012 for evidence of its impact on student achievement.

²⁴ Trodd 2007.

²⁵ Gunton 2013a.

²⁶ NYC Department of Education 2014a.

²⁷ Percentage of students earning more than ten credits in years one, two, and three of high school and percentage of students in the school's lowest third earning more than ten credits in years one, two, and three of high school. Data from NYC Department of Education 2013d.

²⁸ "Lowest third" refers to a metric of student need generated by the city's Department of Education to identify students falling below cohort-specific cutoffs for 8th-grade math and ELA scores.

²⁹ Peer group schools are determined by NYC DOE according to five student population characteristics: average 8th-grade ELA proficiency, average 8th-grade math proficiency, percentage of students with disabilities, percentage of students with self-contained special education placements, and percentage of overage students.

³⁰ For a discussion of the related Weighted Regents Completion Rate, see Corcoran and Pai 2013.



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